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PILING SOLUTION

This application is a continuation of U.S. Patent Application Serial No. 10/054,848 filed January 25, 2002.

FIELD OF THE INVENTION

The present invention relates to building foundations and in, particular pile foundations.

BACKGROUND OF THE INVENTION

Alaska and the Northern Regions are besieged by permafrost and ice rich soils conditions that make the construction of effective and economical foundation systems very difficult and costly. Foundations constantly fail and cause extensive damage to housing and other structures. Although foundation systems have been designed to solve these problems, they are generally not economically feasible for homes, in particular, as well as many other buildings. The budgets available for the construction of housing is not adequate for the installation of elaborate piling or refrigerated systems used for large commercial structures. In fact, the majority of homeowners living in the permafrost regions of Alaska simply acquiesce to high maintenance and repair costs of their homes caused by foundation movement.

Two types of foundations are typically used for housing and light buildings constructed in areas having permafrost conditions. One is "post and pad" and the other is piling.

Although the post and pad system may have many variations, it commonly consists of wood or steel posts designed and supported on treated timber footings. The houses using this system are subject to high vertical and differential movement. The annual freeze-thaw cycles and frost heaves under the pads cause movement resulting in structural stresses to the houses resulting in cracking wallboard, plumbing breaks, broken window seals and doors jamming and in some severe cases, almost total failure of the houses. Most post and pad systems are difficult to adjust once they have moved and trying to re-level the houses has been a major challenge.

Prior piling systems include wood piles, steel piles, round and H driven piles and thermopiles. Generally, these piling systems are far to expensive for housing and small projects because of high materials costs and the cost of heavy equipment such as augers and cranes to install piles at remote locations. Driven steel piles are generally the most economical of the pile systems but it has been costly to install reliable bond breakers on driven piles to prevent jacking. Jacking is characterized as a gradual uplift of the pile due to the freeze thaw action of the surrounding soil. The freeze thaw action causes the surrounding soil to grip the upper part of the pile and lifts it upward. The reason for this is that the soil near the surface has a much stronger adfreeze bond or grip on the pile than does the warmer soil at depth. Therefore, without bond breakers, steel piles can be problematic for use in foundations in permafrost regions. In these prior piling systems, when bond breakers are used, the top five to seven feet of soil around the pile has to be dug out or a large diameter hole is predrilled so the bond breaker can be attached after insertion of the pile into the soil, resulting in wasted time and expense.

In view of the foregoing it can be seen that there is a need for an effective and economical foundation system for housing and other buildings in permafrost regions.

OBJECTS AND SUMMARY OF THE INVENTION

Therefore, it is an object of the invention to provide an anti-jacking pile for use in foundation systems.

Another object of the invention is to provide a pile having an anti-jacking covering thereon to resist the effects of freeze-thaw cycles in permafrost regions.

Still another object of the invention is to provide a collar for facilitating driving of a pile into soil.

Yet another object of the invention is to provide a collar attached to a pile for preventing damage to an anti-jacking covering on the pile.

Still another object of the invention is to provide a method of installing a pile having an anti-jacking covering thereon.

Yet another object of the invention is to provide an adjustable leveling system as a long-term contingency so that the house can be re-leveled in the event of vertical movement.

These and other objects, uses and advantages will be apparent from a reading of the description which follows with reference to the accompanying drawings forming a part thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an elevation view of the method of the anti-jacking pile installed in the ground;

Figure 2 is a top section view of the collar of the anti-jacking pile;

Figures 3 and 4 are fragmentary elevation section views of the connection of the adjustable leveling system and the upper portion of the anti-jacking pile;

Figure 5 is a side view of the connection plate for connecting the adjustable leveling system to the anti-jacking pile, and;

Figure 6 is a side view of the adjustment post.

In summary, the invention is directed to an anti-jacking pile solution particularly suited for use in permafrost and cold regions. The pile includes bond breaking material for preventing frozen soil from directly gripping a pile near the surface of the soil and pulling the pile upward. A collar is attached to the pile to prevent damage and/or displacement of the bond breaking material during driving of the pile. The pile may be attached to a structure by way of an adjustable connection system.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows a pile **10** after it has been driven into place into the soil **12**. A connection portion **13** of the pile **10** extends above the surface **14** of the soil **12**. The diameter and thickness of a steel pile will vary according to the particular building or structure design.

A pilot hole **16** may be drilled into the soil **12** to facilitate driving of the pile **10**. A bond breaker material **18**, is applied to the pile **10** prior to driving of the pile into the soil **12**. The bond breaker material **18**, is preferably a plastic material such that marketed under the names PERMALON® or CANVEX CB12WB, both of which have good elastic qualities under subfreezing conditions. Preferably, the bond breaker material **18** comes in six and eight foot wide rolls having ten to twelve mil thickness and is fastened to pile **10** with an approximately two-inch wide tape. The bond breaker material **18** is wrapped around the pile **10** in two layers and the first layer has a 1/2 pipe circumference overlap. It should be understood that the width of the bond breaker material **18** could vary and other products having similar good elastic

qualities under subfreezing conditions could be substituted. Seams between adjacent wraps are preferably taped full length of the wrap and the lower end **19** of the bond breaker material **18** should also be taped in a thickness necessary to provide a sufficient clamping surface. Alternatively, a layer of grease may be applied to the pile **10** prior to application of the bond breaker material to further facilitate movement of the bond breaker material **18** relative to the pile **10** during soil movement.

In regions of Alaska, the continuous permafrost **20** may extend 1800 feet below the surface **14** of the soil **12**. At the surface **14**, the soil **12** may unthaw and refreeze to a much colder temperature than the permafrost **20**. This area of the soil **12** between the surface **14** and the continuous permafrost **20** is known as the active layer **22**. This active layer **22** is the part of the soil **12** that acts to pull the pile **10** upwardly as the soil **12** expands during frost heaves. Therefore, it is the portion of the pile **10** that is to be permanently located the active layer **22** that needs to be covered by the bond breaker material **18**. The active layer **22** is generally less than five feet in depth and therefore it is preferred that the bond breaker material **18** be applied to that portion of the pile **10** and preferably extending a few inches above the surface **14** of the soil **12** to compensate for uplift of the soil during frost heaves. It should be understood by one skilled in the art that the depth of the pile **10** into the soil **12** will vary according to construction requirements, and it should be understood that the pile **10** will generally extend fifteen to twenty-five feet farther into the continuous permafrost **20** for conventional housing construction.

A collar **24** is attached to the pile **10** adjacent the lower end **19** of the bond breaker material **18**. The collar **24** is preferably constructed of steel. As shown looking at both Figures 1 and 2, the collar **24** extends circumferentially around the pile **10** preferably

overlapping the bond breaker material **18** and tightly engaged thereto to hold the bond breaker material **18** in place during welding of the collar to the pile **10**. Prior to driving the pile **10**, the collar **24** is preferably fillet welded in place along its lower edge **25**. The collar **24** is generally constructed of 1/4 inch in thickness and approximately four inches in height. Although these dimensions are preferred, they may be varied as long as the function of the collar **24** of protecting the bond breaker material **18** during driving of the pile **10** is performed. The diameter of the collar **24** will vary in accordance with the diameter of the pile **10** being driven. Piles **10** for typical housing construction are six inches to ten inches in diameter.

Now looking to Figures 3, 4, 5 and 6, the supporting beams **30** of a building (not shown) are connected to the pile **10** by an adjustable connection system **32**. The system uses a two-part telescoping sleeve **34** and post **36** which slides into pile **10** and is welded thereto. The sleeve **34** includes four plates **38**, **40**, **42** and **44** extending horizontally outwardly from the sleeve **34** to accept connection to support struts **46**, **48**, **50** and **52**. The opposite ends of support struts **46**, **48**, **50** and **52** are connected to brackets **54**, **56**, **58** and **60** which are in turn connected to the support beams **30**.

As shown in Figure 5, a plate **62** is used to join sleeve **34** directly to support beam **30**. Plate **62** provides a larger surface to engage support beam **30** to allow for slight variations in alignment. Sleeve **34** slidably engages post **36** which slides into pile **10** and is welded thereto. The telescoping sleeve **34** and post **36** are adjustably connected by bolts. Post **36** includes a plurality of holes 64 to facilitate vertical adjustment of the telescoping sleeve **34**.

While this invention has been described as having a preferred design, it is understood that it is capable of further modifications, uses and/or adaptations of the invention following in general the principle of the invention and including such departures from the

present disclosure as come within the known or customary practice in the art to which the invention pertains and as maybe applied to the central features hereinbefore set forth, and fall within the scope of the invention and the limits of the appended claims.